

TNO ANNUAL REVIEW

2009



2009

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KEY FIGURES

(in EUR x million)

	2009	2008	2007
TNO (TNO organisation including group companies)			
Knowledge as power			
<i>Within the themes</i>	51.3	47.1	50.8
<i>Across the themes (KAVOT)</i>	27.7	27.2	26.2
Policy and application geared knowledge investments	123.9	120.4	119.4
Total income from government funding ¹⁾	202.9	194.7	196.4
Market income	373.3	405.0	382.5
Income	576.2	599.7	578.9
Net income ²⁾	493.6	504.6	501.9
Added value ³⁾	400.7	407.8	401.8
Operating result before extraordinary depreciations	-12.0	-5.3	8.1
Extraordinary depreciations of tangible fixed assets	-4.7	-5.3	-
Operating result	-16.7	-10.6	8.1
Net result	-14.2	-5.7	12.3
Net result as % of market income	-3.8%	-1.4%	3.2%
Number of employees (effective average)	4,424	4,572	4,634
Number of employees (effective year end)	4,337	4,580	4,658
Net income per employee (effective average) in EUR x thousand	111.6	110.4	108.3
Added value per employee (effective average) in EUR x thousand	90.6	89.2	86.7
Personnel expenses per employee (effective average) in EUR x thousand	85.4	82.8	78.2
Personnel expenses ⁴⁾	377.7	378.6	362.5
Working capital	10.1	31.5	33.3
Equity	187.0	201.1	206.7
Cash flow ⁵⁾	26.8	53.9	56.5
Investments of TNO organisation	29.5	38.3	53.9
Investments of group companies	12.9	19.7	6.5
Current ratio	1.06	1.19	1.22
Solvency	0.43	0.44	0.48

1) Government funding includes the budget reduction implemented by the government, salary and price adjustment as well as a budget for additional security measures

2) Net income = income – direct project costs

3) Added value = net income + other operating income – other operating expenses

4) Personnel expenses includes an additional pension contribution as well as a general salary measure against a reduction of staffing

5) Cash flow = result + depreciations + disinvestments + mutation in equalisation account for investment funds

	2009	2008	2007
TNO Organisation			
Knowledge as power			
<i>Within the themes</i>	51.3	47.1	50.8
<i>Across the themes (KAVOT)</i>	27.7	27.2	26.2
Policy and application geared knowledge investments	123.9	120.4	119.4
Total income from government funding	202.9	194.7	196.4
Market income	291.7	316.9	307.7
Income	494.6	511.6	504.1
Operating result before extraordinary depreciations	-10.1	-6.0	5.0
Extraordinary depreciations of tangible fixed assets	-4.7	-4.2	-
Operating result	-14.8	-10.2	5.0
Result (excl. result of group companies)	-12.7	-6.6	9.1
Operating result TNO core areas	-1.8	1.7	7.5
Net result TNO core areas	-0.5	4.2	10.2
Number of employees (effective average)	3,743	3,833	4,003
Number of employees (effective year end)	3,660	3,813	4,033
Term of work in progress and debtors in months (TNO core areas)	1.5	2.1	2.0
Solvency	0.47	0.47	0.51
Group companies			
Income	85.8	92.8	79.7
Operating result	-1.9	-0.4	3.1
Net result	-1.5	0.9	3.2
Number of employees (effective average)	681	739	631
Number of employees (effective year end)	677	767	625

COMPOSITION OF THE BOARDS

TNO Supervisory Board as of 1 april 2010

J.M. Leemhuis-Stout, <i>chairman</i>	Since 01-03-2001	Chairman of Cedris, organisation for social employment and labour integration, member of the RvT IJsselmeer hospitals, various executive and supervisory positions.
Professor J.M. Bensing	Since 01-09-2008	Honorary Research Fellow of the Netherlands Institute for Health Services Research (NIVEL), Professor of Clinical and Health Psychology at Utrecht University, Member of the Health Council, Member of the Health Sciences departmental board of the Netherlands Organisation for Scientific Research (NWO); member of the NWO Quality of Care programme committee, Vice-Chairman of the Dutch Healthcare Research (ZON) programme committee, Chairman of the GGZ (mental healthcare) (ZON) working group, Member of the Scientific Council for Social Oncological Research of the Dutch Cancer Society (KWF), Member of the Social Sciences Council of the Royal Netherlands Academy of Arts and Sciences (KNAW).
H.W. Broeders	Since 01-07-2006	Executive Committee member of Capgemini S.A., Chairman of ICT-Office, Non-executive director Forrester Research, Vice-chairman of Supervisory Board of Utrecht Exhibition Centre N.V., Member of DB VNO-NCW, Member of AB Stichting Toekomstbeeld der Techniek, Member of SER.
Professor M.C.E. van Dam-Mieras, Ph.D.	Since 01-05-2000	Vice-Chancellor of the University of Leiden, Advisory Board member of Deltares, Supervisory Board member of Unilever N.V., Supervisory Board member of Akzo Nobel Nederland BV.
C. van Dijkhuizen, MA	Since 01-11-2009	Vice-chairman and Chief Financial Officer of NIBC Bank N.V., Member of the Supervisory Board of Museum Meermanno
I.G.C. Faber MBA	Since 01-10-2009	Director of Faber Halbertsma Group, Member of Advisory Board of Science and Technology Policy (AWT), Chairman of FB Ned., Member of the Supervisory Board of Utrecht Exhibition Centre, Member of the Supervisory Board of Rova, Zwolle, Member of the board of the National Register of Supervisory Directors and Supervisors.
Dr. E. Veltkamp	Since 01-05-2002	Former Senior Vice President of R&D Unilever N.V., various executive and supervisory positions.
S.J. Vlaar, MA, <i>secretary</i>	Since 01-09-2008	

TNO Board of Management as of 1 april 2010

J.H.J. Mengelers, MSc, <i>chairman</i>	Since 01-04-2008	Various executive and supervisory positions, including: Executive Board member of Joanneum Research Forschungsgesellschaft mbH, Board member of EARTO (treasurer), Supervisory Board member of TTAI, Advisory Board member of NITG, Innovation Council member (Ministry of V&W), Member of Knowledge Council (Ministry of V&W), Member of Zuidvleugel programme council, Supervisory Board member of Rabobank Eindhoven-Veldhoven, Advisory Board member of SDK (Stichting Delft Kennisstad), Member of the Eindhoven Manufacturers' community, Executive Committee member of Point-One, Board member of SIA (Stichting Innovatie Alliantie), Board member of SKO (Stichting Kennisontwikkeling HBO), Board member of STT (Stichting Toekomstbeeld der Techniek).
Dr. C.M. Hooymans	Since 1-10-2002	Various executive and supervisory positions, including: Deputy Crown-appointed member of the Social Economic Council (SER), Supervisory Board member of Royal KPN N.V., Non-executive Director of Rabobank Vallei-en-Rijn, Member of the Advisory Council for Science and Technology (AWT), Supervisory Board member of Radboud University Nijmegen, Knowledge Council V&W, Knowledge Council LNV, Member of the Social Council of the Faculty of Social Sciences, University of Utrecht, Board of Avond van Wetenschap en Maatschappij, Board of Netherlands Academy of Technology and Innovation (ActI), Global Research Alliance, Board of German-Dutch producers cooperative, Managing Board of Stichting FOM, BMM Executive Board, Supervisory Board of VitaValley, Advory board of Meridian Institute Washington, USA, Board of Koning Willem I Stichting.
Vice-Admiral (retired) J.W. Kelder	Since 01-01-2009	Various executive and supervisory positions, including: Board member of the Indonesian Remembrance Centre Bronbeek, Non-executive director of the Association of the Dutch Historical Ship Museum, Board member of the Netherlands Industries for Defence and Security (NIDV), Board member of the Dutch Maritime Network Foundation (NML), Non-executive Director of Holland Metrology, Non-executive Director of the Hague Centre for Strategic Studies (HCSS), Board member of Innovative Main Port Alliance (SIM), Board member of Netherlands house for Education and Research (Neth-ER), Chairman of the Board of Maritime Knowledge Centre Foundation(MKC).

TNO Council for Defence Research as of 1 april 2010

J.W. Kelder, <i>chairman</i>	Since 01-01-2009	TNO Board of Management member charged with the Defence portfolio.
J. Sikkel, MA	Since 01-03-2008	Ministry of Defence, Deputy Secretary-General.
J.G. Siccama, PhD	Since 01-07-2008	Ministry of Defence, Knowledge and Strategy Policy Advisor.
Major General A. Schnitger	Since 01-12-2009	Ministry of Defence, Director of Operational Policy, Requirements and Planning.
A.W. Miedema, MA	Since 01-07-2008	Ministry of Defence, Director of Personnel Policy.
Maj. Gen. K.A. Gijsbers	Since 01-09-2009	Ministry of Defence, Director of Information and Organisation.
P.J. Keuning, MSc	Since 01-04-2006	Ministry of Defence, Sub-department Head of Defence Research & Development.
L. le Duc, MA	Since 01-08-2004	Ministry of OC&W, Head of Science.
Maj. Gen. (retired) A.C.J. Besselink, MSc	Since 01-12-2009	Chairman SAR.
Maj. Gen. Marine Corps (retired) F.E. van Kappen	Since 01-12-2006	
Dr. A. van Rijn	Since 01-05-2008	Ministry of Internal and Kingdom Affairs, Directorate-General Security, Director of Strategy.
J.H.J. Mengelers, MSc	Since 01-03-2008	Chairman of the TNO Board of Management.
J.V. Elsendoorn, MSc	Since 01-10-2008	TNO Defence, Security and Safety, Managing Director.
H.J. Vink, MA	Since 01-11-2008	TNO Defence, Security and Safety, Director Operations.
Dr. M.P.I. Manders, <i>secretary</i>	Since 01-03-2009	TNO Defence, Security and Safety, Manager Strategy and Planning.

THE TNO PROFILE IN 2009

In 2009 total consolidated income fell compared to the previous year by 24 million euros to 576 million euros (see chart 1). A third of this amount – 203 million euros – was made available via government funding for the development of new knowledge, with 28 million of this earmarked for ‘knowledge as cross-thematic capacity’, or the development of knowledge that is not directly linked to demand from society or the government departments. Distribution of knowledge development via the demand-driven programmes across the departments is shown in chart 2.

The market income of 373 million euros comprises 297 million euros from contract

assignments for the five core areas: this application of knowledge is based on the distinctive position the core areas have built up within the twelve themes through the demand-driven research (knowledge development) referred to above. Chart 3 shows the distribution of market income by Dutch industry (38 per cent), international (35 per cent) and Dutch government (27 per cent).

The other 86 million euros of market income is attributed to the commercialisation of knowledge by the 54 or so companies held by TNO Companies BV and represents the consolidated income of the group companies in which TNO has at least a 50 per cent

stake. There are also 31 companies that have prospered to such a degree that the TNO stake in them has become a minority one. This commercialisation of knowledge receives no government funding and is therefore incorporated in a separate limited liability company (BV) structure. These companies tend to be created as ‘spin-offs’ or ‘spin-outs’ of activities within the five core areas.

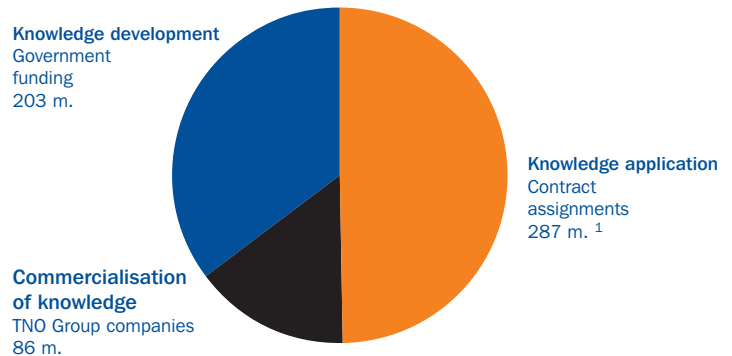
Total international income generated by the core areas and TNO Companies BV fell in 2009 to 130 million euros.

1. Consolidated turnover TNO 2009 (EUR 576 million)

incl. turnover of TNO Group companies
Consolidated group companies
2009 = EUR 86 million

- Commercialisation of knowledge by TNO Group companies 86 m.
- Commercialisation of knowledge Contract assignments 287 m. ¹⁾
- Commercialisation of knowledge Government funding 203 m.

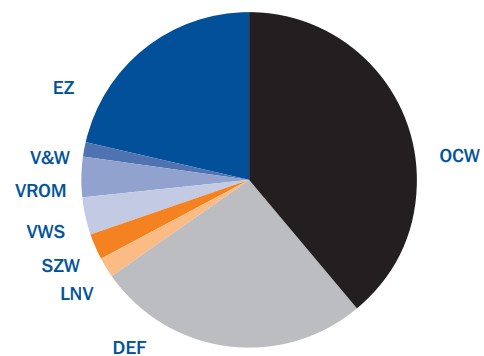
¹⁾ Adjusted for internal turnover



2. TNO government funding 2009 (EUR 203 million)

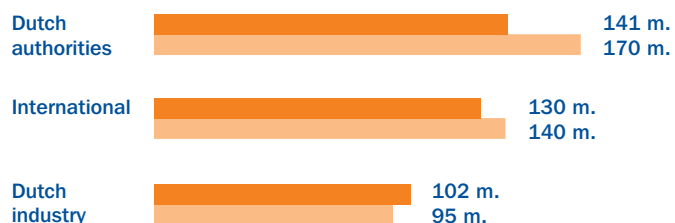
Knowledge as assets within themes (KAV)
Knowledge as assets across the themes (KAVOT)
Policy and application geared knowledge investments (BTK)
ministries:

- OCW 79 m., of which 28 m. KAVOT
- DEF 54 m.
- LNV 4 m.
- SZW 5 m.
- VWS 7 m.
- VROM 8 m.
- V&W 3 m.
- EZ 43 m., of which DINO 16 m.



3. Consolidated market turnover 2009 (EUR 373 million)

- 2009
- 2008



0 50 100 150 200

REPORT OF THE TNO BOARD OF MANAGEMENT

A strong knowledge economy is crucial for the Netherlands. Crisis or not, our international competitiveness depends on our capacity to innovate and develop knowledge. Once again TNO worked at the forefront of new knowledge and innovations during 2009. With applied scientific research, with innovations that have impact. The recession made for a poor year financially but measures were taken promptly to ensure that we did not get left behind but that we could take advantage of the recession and the rapid changes in the international arena and seize the opportunity for strategic and organisational improvements. And boost the Dutch knowledge infrastructure.

THE BOARD OF MANAGEMENT

Following a year of changes, the beginning of 2009 saw the Board of Management gain definitive shape. Upon the nomination of the Minister of Defence, Jan Willem Kelder was appointed to the Board by Royal Decree in January 2009.

The Board of Management now comprises Jan Mengelers (chairman), Tini Hooymans and Jan Willem Kelder.

For 78 years the TNO mission has been to successfully apply scientific knowledge. Once a research institute largely funded by the government, today's TNO is a modern European RTO, Research and Technology Organisation, that undertakes applied research and realises innovations for and with industry and government, nationally and internationally.

2009: THE YEAR OF THE CRISIS

The economic crisis is being felt all over the world – governments, industry and consumers are still reeling from the effects. Undeniably and inevitably the current economic crisis hit TNO, too. While the loss in 2008 was only slight, due to two incidental setbacks, the economic crisis in 2009 was felt in all its intensity and resulted in a loss that by TNO standards was unusually large. Two thirds of TNO's income derives from direct contract research for government and industry customers, and in four of the key market segments there was a drop of some 50 per cent. This was compounded by additional costs associated with having to freeze a major construction project, making a total loss of 15 million euros in 2009, something that could not be prevented in time.

The government announced cuts, with twenty interdepartmental working groups having drawn up inventories of ideas, one of which focused on 'innovation and applied research'. In this inventory the emphasis lies on 'effectiveness and focus'. It has become evident that the government is prepared to reconsider more budgetary scope for applied research. In the first half of 2010 there should be more clarity on this. We won't get out of the crisis just by cutting costs. It is absolutely vital that we invest in innovation and applied research

in both the short and longer term. This is where the most developed and developing economies in Europe and beyond are concentrating their efforts.

The cuts already announced by the Ministry of Defence have been the most explicit, with the intention to slash its current R&D budget from some 51 million euros to 18.5 million over the coming three years.

From the start of 2009 TNO had already begun taking measures to stem the tide and ensure that our organisation would remain strong and financially healthy. Those measures resulted in substantial cost savings in 2009 and we expect that this policy will see TNO achieve its modest but positive forecast targets for 2010. But this will only be possible if the government funding does not recede further after the economic crisis.

Not only did we take appropriate cost-saving measures in 2009 but we also introduced broader measures at the same time and got started on a strategic reorientation of TNO. This new strategy and the choices made will ensure that TNO continues to be strong and healthy in the longer term.

STRATEGIC PLAN 2011-2014: INNOVATION WITH IMPACT

('New answers to new challenges ')

In line with the TNO Act, TNO presents its plans to the Dutch Cabinet once every four years via the Minister of Education, Culture and Science. These plans contain a description of our position and course, and are thus essential in determining TNO's positioning. Last year we drafted the strategic plan for 2011-2014, the result of intensive cooperation and collaboration. Within TNO – from the executive council to the employees –

and with stakeholders in government, science and industry.

Since TNO attaches great value to intensive collaboration with its key target groups, our annual round-table discussions focused on the strategic plan throughout 2009. Around the table were official stakeholders, representatives from interest groups and major clients. There was also a special session with SME representatives as well as regular meetings of TNO directors and staff with politicians, (top) government officials and university representatives to discuss current and future affairs. All these consultation rounds for the strategic plan assure us that we are working on the things that the world around us considers pertinent. At the end of 2009 the result was a clear strategic plan, with clear choices that had been geared in detail to the needs inside and outside TNO. The plan was presented at the beginning of 2010.

In many respects we can consider ourselves satisfied with what we have achieved on the basis of our current strategic plan that runs up until 2010. However, there are also elements that did not reach an optimum level of success. For instance, while our work certainly had an impact on society, government and industry, we could have made that impact more visible. Even though TNO is increasingly becoming more visible and audible in the media, the significance of our work – the added value that TNO brings to society – could be more resonant.

The new strategic plan underlines our intention to work as 'one TNO, with impact, of world class'. So, tightly-knit internal and external cooperation focused on visible results at an internationally prominent level.

- We opt for focus. We concentrate the fields in which TNO works. We will converge from twelve to seven themes.
- We opt for impact. Our added value for government and industry in respect of actual, major societal and economic issues as expressed in article 4 of the TNO Act will be more visible and demonstrable.
- We opt for world class. We strengthen our core areas via our strategic relations with other parties – national and international.

By clustering our strengths nationally and internationally, we boost our power and cut costs. Finally, the solutions of the future will be international and multidisciplinary, cross the boundaries of domains and scientific directions. Hence the importance in the Strategic Plan 2011-2014 of cooperation. TNO will make every effort to boost cooperation further throughout the organisation and will look beyond the boundaries of its own organisation and the borders of the Netherlands. Boundaries are fading – between the fields of those at TNO and between TNO and other RTOs. One subject whereby the impact of TNO is very tangibly apparent is corporate social responsibility (CSO). TNO takes a sustainable approach to work constantly on a better future, primarily for others but also to ensure that we also use our knowledge in a socially responsible manner. The Dutch annual review combines the normal review with the CSO annual review with sections devoted entirely to corporate social responsibility. The goals and ambitions of the Strategic Plan 2011-2014 are indeed ambitious, and we really want to achieve them within that period. However, such shifts in strategy

and organisation cannot, of course, be implemented overnight. In 2009 we refined and finalised the plans; from 2010 we will be working on implementing them.

IN DEED: WHAT DID WE ACHIEVE IN 2009?

TNO is strongly positioned in the international development of knowledge; despite the recession we can be proud of the innovative impact we had in 2009. Below are a number of our achievements of the past year and this review also contains several shining examples of projects that are illustrative of the impact TNO has had.

From Norway to China: international alliances

In order to strengthen our international position we work on alliances and the continual exchange of insight and knowledge with fellow RTOs (Research and Technology Organisations) in Europe. One example is the Carbon Capture and Storage (CCS) cooperation agreement we entered into with the Norwegian Sintef and French IFP in 2009. Another example is our bi-annual consultation with other European top RTOs, for instance concerning a joint approach for Brussels research projects. TNO also has agreements to cooperate with two Russian research institutes (Topchiev and OGRI) of the Russian Academy of Sciences to collaborate on the development of sustainable processes for the oil and gas industry and for new sensor materials. Moreover, this year (2010) TNO has been positioning itself strongly in China, in the field of pharmacy, and has established a Centre for Western & Traditional Chinese Medicine.



Left to right: J.H.J. Mengelers, MSc C.M. Hooymans, Ph.D., J.W. Kelder.

IMPACT WITH SPIN-OFFS

TNO Companies BV is the private limited holding of all TNO participations and focuses on:

- establishing (techno)starters that translate TNO knowledge into products and services and commercialise these;
- establishing joint ventures with strategic partners inside and outside the Netherlands;
- acquiring, optimising and disposing of parts and activities that no longer fit within the portfolio of TNO;
- operating companies with TNO services that can be better offered from a private context, such as many measurement, testing, approval and certification services.

In this way we commercialise and operate knowledge that is largely developed by TNO. TNO Companies BV participates in some 80 companies, is present in 11 countries, has just under 700 full-time equivalent staff and a consolidated income of 86 million euros. TNO Companies BV has established 95 new companies and disposed of 55 companies during the past ten years. The magnitude of this valorisation is greater than the valorisation of the holdings of all the Dutch universities together.

Uruzgan

As strategic partner of the Dutch Ministry of Defence, TNO again focused its efforts in 2009 on improving the effectiveness and safety of the Dutch mission to Uruzgan. TNO experts on operational analysis, roadside bombs and psychological operations were in situ as reservists. The safety of both the men, vehicles and compounds were boosted further by rapidly developed practicable innovations. Examples include the cleverly reinforced baseplates of the YPR vehicles and a new supply of "RPG nets" made from superfibers that protect our observation posts against the feared RPG-7 missile.

Awards: international recognition

In 2009 the TNO 'legionallachip' won the first innovation prize by the European Association of Research and Technology Organisations (EARTO). This prize was awarded for the societal and economic relevance of the product: a chip allows for a more rapid and reliable detection of legionella and whether the contamination is harmful.

Another nice example of the international top position TNO is building is the acknowledgement given to our research proposals by the European Institute for

Innovation & Technology (EIT) in Budapest. Within international consortia of knowledge institutions, TNO is participating in the Knowledge Innovation Clusters (KICs) of the EIT. All three initiatives by the consortia in which TNO is part were accepted by the EIT in 2009, which opens the door to key innovative and international research.

European Framework Programmes

International forms of cooperation in which TNO has successfully operated for a number of years are consortia in which we participate in the Framework Programmes of the European Commission, whereby a high rate (30 percent) of the project proposals we submit is accepted. We have had this kind of success in both the current Sixth Framework Programme and the first portion of the new Seventh Framework Programme. Many of the major innovation projects of the current Sixth Framework Programme were completed in 2009. It should be noted here that the funding of these projects came up against serious, unexpected problems and there is a discussion taking place with the European Commission on how to cover the costs to which the participating applied research institutions are



entitled. The European Commission has made interim adjustments to the cost coverage regulations and TNO, along with the other European knowledge institutions, is in intensive discussion with the European Commission to come to new agreements. The outcome will be vital to all RTOs involved; good agreements concerning cost coverage are a precondition to making participation in future Framework Programmes financially viable. This dispute forms a serious threat to the position and participation of all RTOs in the European Framework Programmes.

***Smart detachment of professionals:
the knowledge workers scheme***

The Dutch Cabinet responded to TNO's BREIN (Beat Recession with Innovation) innovation concept by creating the knowledge workers scheme whose aim is to temporarily detach, and thereby retain, Dutch industry knowledge workers. A unique solution, also when the economy is under pressure. If companies are able to detach their highly qualified specialists to a knowledge institution like TNO with government financial support, they will be in a better position once the economy improves to deploy these professionals again. It is in

this context that TNO and industry have jointly offered temporary innovation projects in 2009 and 2010 to almost 500 knowledge workers threatened by redundancy as a result of the recession. While the scheme is temporary, the collaboration will certainly contribute to network-building and cooperation between industry and public knowledge institutions over the longer term. A successful instance of a knowledge workers project is Building Brains, whereby 125 knowledge workers from some twenty building and construction firms have been detached to TNO. These participants will be spending a year and a half developing ready-made concepts for sustainable neighbourhoods and buildings.

Other key programmes of the Dutch government HTPs (High Tech Top Projects) have been started up with the participation of TNO. Here, too, knowledge workers from industry are being employed in knowledge projects that are relevant to societal themes. This brings the total number of knowledge workers active in projects involving TNO to around 1,500. This, however, has been tempered by the pain of having to let 250 employees go in the same period in which so

many industrial knowledge workers have been 'housed' at TNO.

***Deltares: definitive merging with TNO
business unit completed***

Since 2007 the business unit Subsurface and Groundwater Systems has been detached to Deltares, the independent knowledge institute for delta technology. At the end of 2009 the agreement was signed that saw the definite transfer on 1 January 2010 of the 120 detached staff to Deltares. The relationship between TNO and Deltares will remain very close and will safeguard the geological knowledge that is so essential for the Netherlands.

***New research facilities: NanoLab and High
Tech Automotive Campus***

In 2009 TNO and the TU Delft opened an advanced research facility: NanoLab NL in Delft. This laboratory enables scientists and companies to undertake applied research into new products, materials and applications in the field of nanotechnology. A prominent research lab that makes the Netherlands one of the world's top players in nanotechnology, one of the targets of the Dutch innovation policy.

IMPACT THROUGH VALORISATION

In recent years TNO's patents portfolio has grown strongly. Therefore, 2009 was mainly a year of consolidation of the portfolio on the one hand and more successful valorisation action on the other. Despite the difficult market circumstances, 2009 saw no marked fall in interest in our patents portfolio, with tens of licence agreements. The royalty income rose steadily and because of the positive effects the use of our patents had on our partners' turnover, a positive picture of our impact on the market emerges.

To boost external access to the portfolio, a growing number of patented technologies is being described and offered via TNO's website TNO.NL. At the end of 2009 the number of patent families stood at 829 with the number of new premier registrations 136. The number of patents granted had risen from 1,321 to 1,436 by the end of the year under review, with representation strong in Europe and the United States.

All knowledge institutions taken together, TNO is the major contributor to new protected rights. For the publicly disclosed year 2007 TNO was responsible for around 40 per cent of all the premier registrations submitted by knowledge institutions and universities.

In Helmond we opened new research facilities at the High Tech Automotive Campus where we are working with the automotive industry and top institutes in the field of education and research. These facilities are also ultramodern: a unique emissions lab where we can scrupulously test and measure heavy vehicle exhaust gases in a variety of simulated driving and environmental conditions.

2010: PRELUDE TO A NEW STRATEGY

In 2009 we worked hard to get our own house in order and, as a result, we go in to the new year with every confidence of being able to gain a positive result. The cost savings of recent years are bearing fruit and lie at the basis of this confidence. Market turnover has been conservatively estimated on the basis of 2009 when the low point was reached. This has enabled us to project a positive forecast, conditional, of course, on the government funding set for 2010.

2010 will be an important transitional year; the prelude to the implementation of the new strategic plan, a year in which we:

- present the definitive Strategic Plan 2011-2014 to the Cabinet, reveal clearly the position and added value of TNO in the public debate, certainly in a time when government spending is being cut and when the tendency is to reduce state expenditure on applied research;
- make the step to a modified organisational shape that optimises cooperation and breaks free of organisational boundaries – the thematic organisation of projects;
- work on a cultural shift that fits the conceptualisation underlying the strategic plan: 'one TNO, with impact,

of world class';

- give definitive shape to seven themes that will be the focus of TNO: comprehensive safety, industrial innovation, healthy living, energy, mobility, built environment and information society. These themes will be the foundation on which we steer our applied knowledge development and market development;
- clarify the positioning of TNO, strongly embed TNO among our stakeholders and gain a broader public profile;
- reinforce international cooperation with even firmer partnership contracts with other domestic and foreign RTOs as well as gain more prominence among the relevant bodies and committees in Brussels.

Vision and mission of TNO

In the prelude to the Strategic Plan 2011-2014 we have also reconsidered our vision and mission based on what is needed to solve future issues as well as the role and task TNO sees itself fulfilling.

Vision: Innovation has brought progress: a prosperous society and competitive industry. However, shifting relationships around the world and the scarcity of resources in areas like energy, raw materials, space and health require breakthroughs in terms of concepts and action. Technological and social innovation are crucial to this, and the entire range of technologies has a role to play. As the boundaries that separate domains, disciplines and countries fade, national and international cooperation becomes increasingly prominent. TNO wants to be at the axis of this fusion, in the middle of society where its integrated knowledge can be put to optimum use for

FINANCE AND OPERATIONS

In 2009 the consolidated income fell by 23.5 million euros to 576.2 million (-/- 3.9 per cent). The negative result of 14.2 million euros was thus 18.2 million euros down on the target for 2009. The negative result for 2009 was largely influenced by additional provisions, depreciation of initial investments for the proposed new site in Cromstrijen, an additional pension contribution as a result of the low level of coverage of the TNO Pension Fund at the end of 2008 (income minus direct project costs) due to the credit crisis. The effects of the lower income were partly compensated by the cost reductions implemented in 2009. Compared with the result for 2008 (5.7 million euros negative) this represents a sharp drop. Given the recent economic developments, and the positive effects that the cost reductions undertaken in 2009 will have in 2010, the business plan for 2010 is based on a fairly positive result.

Income

The income of TNO – the TNO organisation including group companies - was 576.2 million euros, a fall of 23.5 million euros on 2008. The fall in net income, however, by 11 million euros to 493.6 million, was tempered by the effects of cost reductions in direct project costs. The income of the public

organisation decreased by 17 million euros to 494.6 million euros; the income of the group companies, coming under the 100 per cent holding TNO Companies BV, fell from 92.8 million euros in 2008 to 85.8 million in 2009, a fall that is largely attributable to the severe economic recession of 2009.

The income figure includes the budget cuts implemented by the government, the salary and price adjustment as well as a budget for additional security measures. Market income dipped by 31.7 million euros to 373.3 million (2008: 405 million euros) and so came to 65 per cent of the total income. Domestic income (industry and government) was 21.8 million euros lower than in 2008 at 243.3 million euros while foreign income, including TNO group companies, fell by 7 per cent to 130 million euros.

Operating costs

Personnel expenses fell by 0.9 million euros. Personnel expenses includes an autonomous salary measure for 2009 of around 8 million euros against lower salary expenses of around the same figure due to a decline in staffing numbers. Pension costs rose by 7.2 million euros due to the low level of coverage afforded by the TNO Pension Fund at the end of 2008. The other personnel expenses revealed a drop of 6

million euros due to intentionally less hiring of temporary employees. The other operating costs fell by 5.6 million euros on 2008, a fall largely attributable to lower business accommodation costs and cost reductions implemented in respect of outsourcing. Depreciation costs, which fell slightly by 0.1 million euros compared with 2008, include the amortisation of the initial investments of 4.7 million euros for the proposed new premises in Cromstrijen.

Liquid assets

At the end of 2009 the liquid asset balance stood at 113.7 million euros, a rise of 8.8 million compared with the end of 2008. This rise was due to outgoing cash flow from investments of 41.8 million euros against incoming cash flow from operations of 50.9 million euros. Investments for 2009 relate to 23.1 million euros for buildings, premises and fixed technical installations, including investments in the EuroLoop research and test facility in Rotterdam Pernis, along with the assembly work at the Nanofacility in Delft and animal facility in Leiden. In addition, 18.6 million euros were invested in technical resources, inventory and intangible fixed assets.

and with government and industry. We have the people with the right blend of curiosity, creativity and idealism to make it work.

Mission: TNO connects people and knowledge to create innovations that boost the sustainable competitiveness of industry and well-being of society.

EMPLOYEES MAKE THE DIFFERENCE

The complex and multidisciplinary issues of tomorrow demand innovative solutions. Solutions for which TNO is largely dependent on the quality of its employees. And what we demand from them is not only intrinsic excellence but especially commercial and project-gearred skills along with leadership and collaboration competence. After all, each day our employees have to confront complex dilemmas with integrity and commitment. We promote this through acting as a breeding ground and springboard for talent, formed in part by the annual development appraisals, personal competency development and a pleasant, healthy working climate. In addition, TNO carries out an employee satisfaction survey every one or two years in order to be able to respond to the wishes of its employees. Those in the employment market still regard TNO as a highly attractive employer. In 2009 TNO again made the top ten favourite employers in the Intermediair Image Survey. A similar survey carried out by Memory

Number of contracted TNO employees 2008-2009

	2008	2009
Number (nominal)	4,105	3,919
Permanent	3,527	3,464
Fixed term	578 (14.1%)	455 (11.6%)

Magazine showed TNO in the top 20 for the first time as a 'favourite employer for women', in 14th spot. In 2010 we gave shape to our aim to be a 'breeding ground and springboard for talent'. This approach, part of the TNO strategy, gives our employees scope to develop and perform to their maximum capability. Success is based on visible leadership, talent development and collaboration.

OCCUPATIONAL HEALTH AND SAFETY

In 2009 TNO's absence through illness was 3.4 per cent (2008: 3.3 per cent and 2007: 3.2 per cent). For 2010 we are aiming to stabilise or reduce absence through illness. In 2009 various developments occurred in the field of occupational health and safety (arbo) and health. TNO worked on the Arbo catalogue, amended the health policy and responded to threats from the H1N1 virus.

Arbo catalogue and arbo coordination consultation

In 2009 the Arbo catalogue developed by TNO employees for the Board of Management in 2008 was updated. The Arbo catalogue contains not only our policy and guidelines in the occupational health and safety area, but particularly solutions and measures to work in a safe and healthy way. The arbo coordination consultation that involves the arbo coordinators from all the core areas and corporate departments contributes to this.

Health policy

In 2009 we paid extra attention to the health and vitality of our employees, introducing together with our health insurance company 'ProfiTaal', an innovative approach to corporate healthcare. Our health policy will ensure both the mental

and physical health of our employees in the future, with the emphasis on prevention. Part of this approach, for example, is TNO's lifestyle and exercise programme. In any case we will be introducing a variety of 'pilot interventions' until 1 January 2012 to support our health policy and so intervene to prevent employee loss, reduce absence due to illness and accelerate the reintegration trajectory.

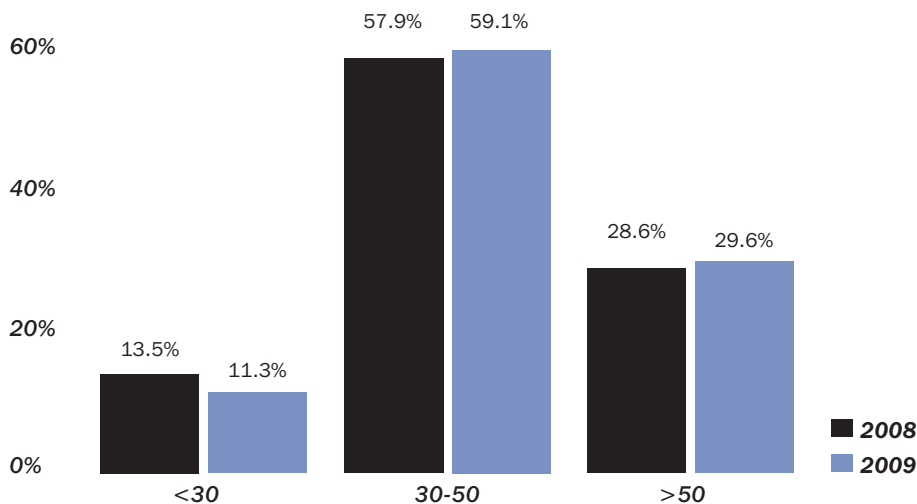
H1N1 virus

Following the outbreak of the A H1N1 influenza virus, in May a coordination team was established from all TNO disciplines to deal with the pandemic issues for the entire TNO organisation throughout the rest of the year. This team took the necessary precautionary measures to ensure operational continuity and restrict the spread of the virus.

TRENDS IN EMPLOYMENT CONDITIONS

TNO and the Central Works Council met to discuss employment conditions for 2010, reaching agreement in the year under review. This agreement took account of the disappointing results for 2009. In general the outcome entails:

- Salaries to remain unchanged.
- Employer contribution to the 'course of life' scheme to be raised by 0.39 percentage points.
- Employees at risk of losing their jobs through reorganisation to be supported by a centralised mobility centre to help them find other work. TNO operates a notice period of three months if an employee gets a different job, moves to another location or is made redundant due to reorganisation.
- The offer of healthy food at TNO company



Age distribution

Overview of the age distribution of our employees between 2008 and 2009

canteens in line with corporate social responsibility. Home or teleworking, tele- and videoconferencing as well as travelling by public transport will be stimulated.

EDUCATION AND DEVELOPMENT

TNO expects its employees to take initiative for ongoing development. We facilitate this and create a culture in which 'grow (and go)' is a given and maximum deployment options (within and outside TNO) the goal, thereby reserving 5 per cent of the salary amount for education and training.

TNO operates a wide range of initiatives and programmes to facilitate the personal development of its employees, such as competency coaching, various training programmes and development interviews where our development paths and job performance appraisals twice a year have an important role to play.

In 2009 we also looked closely at how TNO spots, supervises and appoints internal talents. By making this approach more professional, we

want to be able to fill 80 per cent of our key positions with talented internal candidates and, in doing so structurally boost the proportion of women and foreign nationals in this share.

Development of new employees

In addition to attending to its more experienced employees, TNO wants to ensure that its new employees get off to a good start. They first attend our introduction days (Net-werken@TNO) and then receive training in project work, customer focus and personal effectiveness. 'Corporate Social Responsibility' has been a fixed component of this programme since the beginning of 2009. New graduate employees also follow a Talent Development Programme that has additional education modules for personal effectiveness and customer awareness.

For (appointed) executives and potentials there are various TNO-wide programmes available for all development paths, not just line management. These programmes reinforce professional development, management skills, leadership and development of vision and

strategy. On top of this, we put extra focus on leadership and working in (a range of) teams.

DIVERSITY IN 2009, ACTION FOR 2010

TNO is convinced of the added value of diversity within teams, so we do all we can to maintain and reinforce that diversity, with the signing of the 'Talent to the Top' charter an important aspect of this. This also subscribes to tangible measures over the coming years to get on board, retain and appoint more female talent.

In the year under review 31 per cent of our 3,919 employees was female, a slight rise on 2008 (30.5 per cent female). In 2009 there were 268 new employees, thirty-nine per cent female (this was forty per cent in 2008). Our aim is to get at least twenty-five per cent qualified female employees in executive and management positions by 2013. This figure was twenty per cent in 2009. To this end we are preparing policy and action in respect of attracting, promoting and retaining female employees. For upper management this goal

has already been achieved. In the longer term we aim for management staffing to reflect the entire TNO population.

Cultural diversity is a further point for attention in 2010. We want to attract and retain foreign talent and bring about cultural awareness among management and employees so in 2009 a talents group was established within TNO that will make a recommendation in 2010 for future action.

Number of international employees at TNO

In 2009 there were more non-Dutch employees than in 2008. On 31 December 2009 the figure was 199 compared with 183 on 31 December 2008, equivalent to 4.9 per cent of our workforce (4.3 per cent in 2008). This does not include Dutch nationals of foreign origin and employees with dual nationality (one being Dutch). Of new employees to TNO 17 per cent were non-Dutch nationals, a rise of 5 per cent on 2008. Since we want to take account of non-Dutch employees, we are working on dual-language internal communication supplemented by key internal messages being expressed also in English. The TNO personnel magazine contains an English-language summary. In 2010 the range of products available at our company canteens will be more international.

CODES OF BEHAVIOUR

The TNO Corporate Code contains the four core values that underlie the behaviour of TNO employees and reveal our business principles. Our core values are integrity, independence, professionalism and social responsibility. Further to these, we also employ the principles of market and customer

focus, cooperation and humanity. In 2009 the core values were processed in various education and development programmes, like the introduction days for new employees.

CORPORATE SOCIAL RESPONSIBILITY

TNO takes Corporate Social Responsibility (CSR) seriously. Our efforts towards greater sustainability take account of employees and the environment. There is more on this in section 'With the environment in mind'.

By improving our communication and transparency we make CSR negotiable. It has thus become a fixed component of the Net-werken@TNO programme for new TNO employees and updated information on CSR developments can be found easily on the intranet. TNO employees shared their views and experiences about CSR with colleagues from other companies and organisations at the beginning of 2009 during the first 'Young Leaders For Nature' forum. An internal CSR network encourages sustainable innovations and contributes to a more sustainable operation.

CSR concerns sustainability, the balance between people, planet and profit. Our work fits this perfectly. TNO studies all kinds of economic and societal knowledge issues. 'Sustainability' is not a separate theme but a central thread that runs through every theme and is thereby embedded in our primary process. It is evident that in making our operation more sustainable, we apply our extensive knowledge of sustainability. In 2009 much attention focused on safeguarding and embedding CSR in the organisation. We have looked at how other organisations apply sustainability so that we can refine how we apply our own policy on sustainability in 2010.

The CSR steering committee (containing two core area directors and a portfolio holder) supervises the CSR officer and at least once a year the Board of Management discusses with the CSR steering committee the results that have been achieved and any adjustments to the CSR policy.

As in the first CSR annual review of 2008, for 2009 we have also opted to use the GRI framework for sustainability reporting. At the end of this annual review there is a table that refers to all the GRI elements in this review.

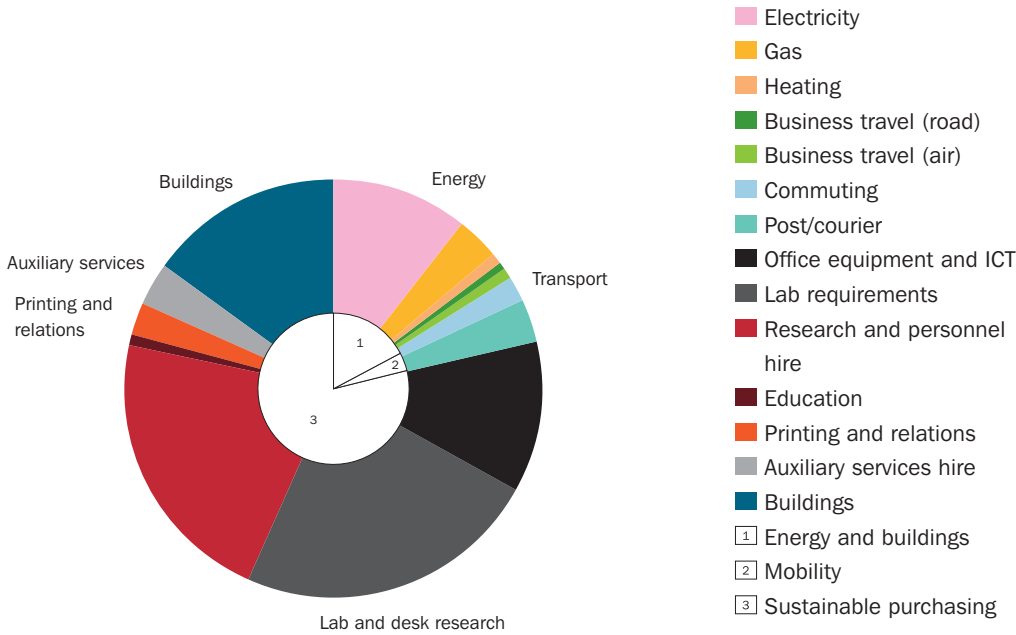
DEVELOPMENT COOPERATION PROGRAMME

Since 2007 TNO has been working on innovations in developing countries from a CSR policy perspective. TNO wants to promote regional economic growth and individual welfare by offering solutions to issues relating to nutrition, health, water, energy, climate and ICT. The principle is that new products and services must be affordable and available to the poorest. TNO appears to have a lot to offer to innovations in developing countries and the sustainable reduction of poverty. TNO will be continuing such efforts in the coming years in cooperation with many other parties. We will thus be contributing to the Millennium Development Goals subscribed to by 189 UN countries (including the Netherlands).

A good example: the Flying Innovation Team

The Flying Innovation Team (FIT) is a team of twenty experts established by TNO to participate in projects in developing countries. These TNO employees are trained to innovate in developing countries with a focus on safety and ethics. The FIT has set up cooperation

Environmental footprint of TNO in 2009



links in India, Ghana, Zambia, Ethiopia and Uganda.

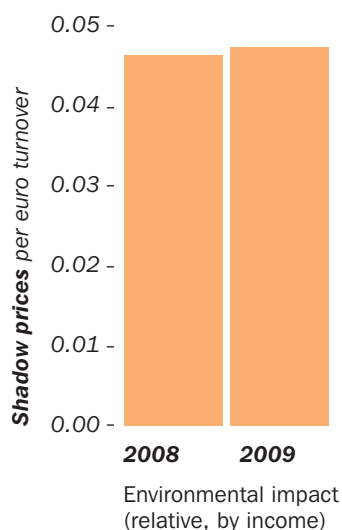
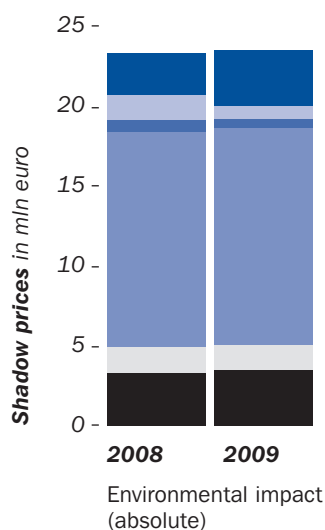
2009 results and 2010 ambitions

In 2007 and 2008 we looked at setting up partnerships with NGOs and knowledge institutions. We also took stock of the needs of our target group and created and tested several innovative solutions. In 2009 we worked on business models and partnerships to bring successful pilots to production. We are working on fifteen projects whose themes comprise Energy and Climate, Food and Agriculture, ICT and Monitoring. Page 48 of this review contains a description of this work in Ghana. FIT was also active in

the field of decentralised and sustainable energy generation in India and Madagascar. In India and Ethiopia we introduced the use of rock wool for farming in semi-arid areas to reduce the costs of irrigation and boost the survival rate of young crops. The development cooperation programme is appreciated by the local communities as well as by NGOs and policymakers. Moreover, the Ministry for Development Cooperation (DGIS) wants to collaborate with us on four of our projects and the World Bank has expressed interest in the knowledge and approach of TNO.

WITH THE ENVIRONMENT IN MIND

Corporate social responsibility naturally encompasses a focus on the environment. To gain insight into our environmental impact an environmental footprint was first established in 2008 – this enables us to formulate policy that should help us improve our environmental performance. To this end, we defined three main elements: energy and buildings, mobility and sustainable purchasing. In 2009 we added a fourth: energy and ICT. In 2010 we will continue to take specific initiatives to improve TNO’s environmental footprint in these areas.



- Energy
- Transport
- Lab and desk research
- Printing and relations
- Auxiliary services
- Buildings
- Total

Environmental footprint in 2009

In 2009 an environmental footprint of TNO was made for the entire production chain of energy, mobility and purchased products and services¹. The footprint is divided into several categories. The 'Lab and desk research' category, for instance, contains the environmental impact of the production of paper, computers, copiers, printers and the use of internet and telephony. Different environmental effects that occur through emissions due to production, travel or energy production have been combined by using shadow prices resulting in shadow costs, also known as environmental euros.

Environmental index: a summary

- Energy: in 2009 TNO consumed 46 million kWh of electricity and 6 million m³ of gas. This represents a rise in electricity consumption of 2 million kWh and in gas of 0.6 million m³ compared with 2008. The gas consumption of TNO resulted in 15.4 ktonnes of direct emission in 2009.

- Transport: there were 15 million kilometres of business travel by car in 2009 (2008: 17 million kilometres) and around 25 million air kilometres (2008: 27 million kilometres). In total the transport of goods and employees in 2009 contributed 9 per cent to TNO's environmental footprint.
- Paper: TNO used around 100 tonnes of paper, or half a kilo per week per employee. Paper accounted for just 0.08 per cent of the total environmental impact of TNO, whereby it is clear that TNO has considerable potential for improving this environmental impact through a focus on all purchasing categories.
- The energy consumption, transport and purchased products and services in 2009 represent energy consumption – direct and indirect – of 3.2 PJ and 204,000 tonnes of (in)direct greenhouse gas emissions measured in CO₂ equivalents. Both rose slightly by 0.3 per cent on 2008.

- Despite a fall in transport and expenditure on auxiliary services and lab equipment, the environmental impact in 2009 was little different to the previous year (rise of 0.2 per cent on 2008). This is largely due to the fact that we spent more on hiring in research and personnel, buildings and more energy consumption referred to above.
- The environmental impact of TNO depends on our activities. In relative terms, per euro of income, the environmental impact of TNO in 2009 rose compared with 2008 since this remained more or less the same while income fell.

WORKING TO REDUCE THE FOOTPRINT

In an effort to reduce our footprint, we have drawn up a number of improvement measures for the different elements.

Energy and buildings

To identify energy-efficiency improvements in

¹ The environmental impact of energy, commuting and business travel is determined according to the 'physical' consumption: travel kilometres, kWh electricity, m³ gas, etc. The environmental impact of the other categories is determined by the purchase value and average environmental impact per euro. The method of establishing environmental impact for the whole production chain (scope 3) is similar to establishing 'embodied energy' consumption but is broader due to the incorporation of several environmental effects like greenhouse gas, acidification, fertilisation and toxicity. These different environmental effects are summed up on the basis of shadow prices that are determined according to the theoretical costs of preventing emissions. The environmental impact is expressed in shadow costs ('environmental euros') and is a yardstick for the social costs of the environmental impact.

TNO buildings use has been made of energy performance calculations and a sustainability check along with the Greencalc score that is able to compare the sustainability of TNO buildings with those of other companies. These processes will enable us to establish a plan for improvement in 2010 that will describe how and within what period we aim to improve the energy performance of the premises owned by TNO. We are selecting improvement measures on the basis of economic principles and in line with major maintenance moments as far as possible. The results of the energy scans are also incorporated in the future accommodation policy. Our policy in 2010 for leasing new premises will contain the requirement that the premises to be leased must contain the minimum energy label. With this energy requirement TNO will also be discussing with the lessors the option of co-investing in energy-efficiency measures in the premises. Since we are keen that energy-efficiency can remain successfully employed, we are taking the appropriate technical measures and establishing a separate facility management group to encourage energy efficiency and set up an energy monitoring system in 2010. The guiding principle for this is the SenterNovem step-by-step approach towards more sustainable offices.

Mobility

Mobility relates to all forms of movement of TNO employees, both commuting and business travel, and we see several solutions here to reduce the environmental impact. For instance, we try to cut down on business travel by improving videoconferencing possibilities and encouraging people to use means of transport with less of an

environmental impact, like cycling or using public transport to work instead of the car. TNO has also subscribed to various mobility agreements like 'Accessible Haaglanden' and is participating in initiatives in the area of sustainability and mobility as in 'the new way of working'.

Sustainable purchasing

At the end of 2008 the purchasing organisation developed a 'sustainable purchasing' plan – in 2009 this provided the basis for the development of tools, procedures and knowledge that enable and encourage sustainable purchasing at TNO. The principle is the SenterNovem requirement of sustainable purchasing by the government, which means that we take account of environmental and social aspects in all phases of the purchasing process. Through sustainable purchasing we adjust to our indirect energy consumption and associated greenhouse gas emissions. We 'measure' the environmental impact of purchasing on the basis of environmental impact factors, our purchasing portfolio and category management, also evident in the TNO environmental footprint.

Sustainable purchasing leads to a visible result. Some examples from 2009:

- Health and safety has been adjusted to the new health-oriented health and safety policy and thus on prevention.
- In 2009 TNO signed a contract for green energy supply from 1 January 2010, thereby lowering indirect fossil fuel consumption for energy generation and associated CO2 emissions.
- The gas supplier was given a sustainability check; product requirements for gas (biogas)

appeared not to be viable.

- We purchased energy-efficient ICT storage equipment and thus reduced our electricity consumption.

In 2010 TNO employees will notice that we attended to different sustainability matters in 2009, like office equipment, catering, cleaning, coffee makers, printing and post. We will be expanding this in 2010 and we intend to incorporate sustainability in our contract management, with additional focus on existing contracts, as well as examining how we can make the effects of sustainable purchasing evident.

ICT

ICT is a major energy consumer: ICT application is responsible for 2 per cent of the total global energy consumption, comparable in quantity with the entire aviation sector. TNO is no exception here, so in 2009 'energy and ICT' was added as a focal area for improvement and plans were drawn up for 2010 when TNO will be undertaking a baseline measurement to find out how ICT energy consumption can be reduced. Dataprocessing is a good example. By taking an innovative approach to this, the amount of servers within TNO can be reduced and a considerable amount of energy saved. We are also expanding our accessible videoconferencing capacity to prevent unnecessary travel and loss of time.

ALTERNATIVES TO ANIMAL TESTING

Society is setting increasingly higher demands on the safety and efficacy of products, whether medicines, food, care products or our living and working environment. To safeguard safety and efficacy animal testing is carried

out, and even prescribed in part by law. TNO has been developing alternatives to animal testing for years along the three Rs principle: replacement, reduction and refinement. We are also keen to make use of these developments ourselves. While this does not mean that TNO will be undertaking no animal testing in the coming years, it does mean that TNO will continue to make very specific use of its own research resources to cut back the number of animal tests, developing alternatives and making these available to others. We also promote acceptance of these alternatives.

Thanks to a contribution from the Ministry of Economic Affairs, TNO was able to acquire a device in December 2009 that enables human research by administering small amounts of a substance (microdosing). This innovative technology will, much more than has been possible to date, generate data on the behaviour of candidate drugs in the human body, which will drastically reduce the need for animals for pre-clinical testing.

Results for 2009

In 2009 a communication campaign got under way to inform NGOs and companies about what TNO is doing in respect of the three Rs. These organisations have also been invited by TNO to cooperate, an initiative that may accelerate the development of alternatives to animal testing.

At the end of the 1980s TNO developed a test whereby slaughtered chicken's eyes could be used to ascertain the level of eye irritation, which would replace the testing of substances in rabbits. In 2009 the OESO approved this test as a method to determine serious eye irritation without the need for animal testing.

TNO worked with the LUMC to develop a new research model for rheumatism that is free of the need for animal testing. In 2009 we were awarded the Willy van Heumen prize for this from the Stichting Stimuleringsfonds Alternatieven voor Proefdieren (the foundation for encouraging alternatives to animal testing).

Delft, 17 March 2010

J.H.J. Mengelers, MSc, chairman

C.M. Hooymans, PhD.

J.W. Kelder

CORPORATE GOVERNANCE 2009

Corporate governance stands for good corporate management, supervision, effectiveness and efficiency. TNO subscribes to these principles and applies the principles of the Code of good corporate governance voluntarily. Corporate governance is embedded within TNO in a code of conduct, complaints procedure, organisational regulations and a whistleblower procedure.

TNO's challenge is not only to comply with these regulations and principles but also to go beyond the accountability that is required to carry out its legal duty to include a public responsibility in the way it acts and the quality of its service. Areas where improvements can be made include the reporting of risks associated with the activities of the organisation. Governance is inextricably bound with the activities of TNO.

THE TNO BOARD OF MANAGEMENT (RVB)

The RvB is charged with managing the organisation, which includes taking responsibility for the objectives of the organisation, its strategy, financing and policy. Consultative management means that the members of the board are collectively and comprehensively responsible and each board member is accountable for exercising this responsibility.

COMPOSITION OF THE TNO BOARD OF MANAGEMENT

The RvB comprises three members. Vice-admiral (retired) J.W. Kelder was appointed as RvB member by a Royal Decree of 2 February 2009.

THE TNO SUPERVISORY BOARD (RVT)

The duty of the RvT is to supervise the policy, management and all other conduct of the RvB and the participations of TNO. The TNO Act stipulates which RvB decisions require the approval and agreement of the RvT. Equally important is the advisory task of the RvT.

COMPOSITION OF THE TNO SUPERVISORY BOARD

The RvT comprises seven members. Ms I.G.C. Faber, MBA, was appointed on 1 October 2009 to succeed Mr G-J. Kramer, MSc and Mr C. van Dijkhuizen, MA, succeeded Professor L. Koopmans, PhD, on 1 November 2009.

The RvT held seven ordinary meetings in 2009 as well as further extraordinary meetings to more thoroughly and specifically consider the financial situation and strategic

choices contained in the proposed Strategic Plan 2011-2014. Two separate meetings of the Remuneration Committee took place along with one meeting of the selection and appointment committee. For both these committees there was considerable contact outside the meeting. The Central Works Committee held two consultative meetings in 2009.

In October 2009 the Standardisation draft bill concerning the remuneration of executives from public funds (WNT) was widely debated, also among the TNO RvT members. In the research institutions sector there is no comparative institution and TNO should not come within this bill according to the criteria stated in the WNT. The RvT attaches value to a transparent, suitable remuneration for TNO executives and recently reviewed the remuneration structure whereby the remuneration has been adjusted downwards compared to earlier designations. The RvT intends to stipulate the new remuneration policy in a code that can be linked to the codes already ratified by the Dutch Cabinet.

On 16 December 2009 the RvT discussed its own performance and that of the RvB and concluded that the cooperation and communication took place on the basis of openness and trust. The complementary competencies and preferential domains of the RvT members are beneficial to the RvT's performance and are appreciated by all.

ACCOUNTABILITY

Accountability to the government takes place through the submission of the strategic plan and annual budget as well as retrospectively by an audit of the annual accounts. An

Audit Statement as approved by the RvT accompanies the annual accounts. The RvT entrusted the audit of the 2009 annual accounts to KPMG. The accountant also undertakes a separate audit for lawful collection and spending according to the audit protocol agreed between OCW (Ministry of Education, Culture and Science) and TNO. The RvT discussed the accountant's report with the accountant in the presence of the RvB. On 17 March 2010 the RvT discharged the RvB for its management and policy in 2009.

A governmental consultation took place between the OCW minister and the RvB on 14 October 2009.

Delft, 17 March 2010

On behalf of the TNO Supervisory Board

J.M. Leemhuis-Stout, MSc, chairman

TWELVE THEMES

Every four years TNO devises new research programmes. These are series of research studies related to a coordinating theme. Our choice of subjects is not arbitrary. On the contrary, we work on the basis of social themes set by the Dutch government: topical subjects and issues that are both interesting and relevant from a policy perspective – and that demand new answers. After four years, the responsible ministers evaluate our research and, adjust the research programmes as necessary. In 2008 TNO worked on twelve social themes (see below). These themes form the framework for TNO's knowledge development, enabling it to have a substantial impact on our society. Together with our clients, we are working on projects that are helping to build a better future. The new strategy period that takes effect in 2011 will comprise seven themes.

EMPLOYMENT PARTICIPATION AND THE AGEING POPULATION

Employers prefer staff who are young, healthy and enterprising. But the pool of older people in the employment market is growing faster than the younger group. Moreover, the total number of working people in the Netherlands is declining all the time. To prevent employment productivity falling even further, more people have to stay healthy and in work for longer. Anyone currently not in employment must be encouraged to work in the near future. TNO contributes knowledge and expertise in order to maintain the current level of employment participation.

FOOD

Healthy food in a prosperous country like the Netherlands would seem quite natural. Yet ever more Dutch citizens are struggling with excess weight and other health problems. In response, we are being more demanding of what we eat. It must be tasty and suit our lifestyle but it mustn't make us fat. And, most of all, we want it to be healthy. Moreover, our food must be safe and must stay that way even when new dangers are lying in wait for us – new infections and pathogens or resistance to antibiotics. TNO is helping to generate solutions to such food issues through its fan of scientific disciplines, from chemistry to ICT.

ACCESSIBILITY

Dutch people sit in traffic en masse. And it isn't only the roads that are congested. Water, rail and air options are all close to maximum capacity. Consequently, the continued growth of passenger and goods transport presents Dutch and European society with huge problems, such as substantial investment

in the construction and maintenance of infrastructure and terminals, not to mention the impact on quality of life. Traditional solutions, such as more asphalt, are no longer sufficient to accommodate the growing transport requirement. Innovative and smart alternatives are vital. And TNO is contributing a significant share of those.

CONSTRUCTION AND SPATIAL DEVELOPMENT

The Netherlands is a small country, and the art of living there is to design the space such that the various stakeholders, from residents and companies to road users and environmental groups, can live in harmony. So that the country can be developed sustainably. Sustainably for the people that live there, for the environment and for the economy. TNO examines how the various interests can best be weighed up against each other and served. And, more importantly, how you can use that input to improve policy.

DEFENCE

The Dutch armed forces take a significant part in international operations, whether peace missions or active intervention in military conflicts. To keep our armed forces effective and affordable, the Ministry of Defence needs scientific and technological knowledge and expertise. Which is why TNO acts as a knowledge partner for the ministry. Not only do we develop smart technologies and materials for the army, air force and navy, we also advise on optimum organisation and operational command processes. In such a way, we help the ministry to defend Dutch and allied territory, maintain international order and support national and international

authorities in keeping the law, combating disasters and offering humanitarian aid.

ENERGY (MANAGEMENT)

We are using ever more energy. An excessive number of home appliances are pushing up energy consumption and flights to far-off destinations are commonplace. The result is that our energy sources are becoming exhausted. And yet we want our children to be able to skate and ski in the winter when they grow older. This means that we will have to change the way we manage our energy needs – but how? TNO is investigating by studying the exploration and production of oil and gas as well as sustainable (geo-)energy.

HEALTHY LIVING

Life in the Netherlands is getting unhealthier by the day. Younger people in particular hardly exercise and prefer to eat fast-food than a good meal. Moreover, the population is ageing, and with ageing comes deficiency. And so our healthcare system can hardly cope with demand. Creative solutions for these problems are absolutely vital. TNO is helping to achieve this by bringing its knowledge and expertise in the field of healthy living. Our focus lies on youth and health, exercise and health, and innovation in healthcare.

NATURAL AND BUILT ENVIRONMENT

More and more people are living in our country; their mobility and activity are increasing and their consumption is ballooning. The space that exists is therefore being used more intensively and is being put to multiple uses. TNO wants to help reduce the strain on the natural and built environment by developing knowledge for policymakers, among others, and by focusing on two areas:

the quality of our living environment and the sustainable use and management of the subsurface.

LIVING WITH WATER

In the Netherlands we are quite used to it: living below sea level. However, our delta is becoming increasingly more densely populated, and climate change is causing sea levels to rise. This has generated water targets, both national and international. Examples include the Dutch targets set by the National Governing Agreement on Water, the European Framework Directive on Water and the Millennium Development Goals of the UN. Achieving these targets is a crucial social task we face: action is the order, innovation the necessity. TNO is a supplier of these innovations.

PUBLIC SAFETY

Safety is a hot issue. For good reason. Criminals are working on an ever broader scale, terrorism has an international arena, petty crime is also on the increase and vital facilities are vulnerable. The threat of natural disasters is also growing. But people in the Netherlands still want to be and feel safe – without compromising their privacy and freedom of movement. TNO contributes to these goals by combining its research efforts on various fronts, like intelligence, ICT and behavioural science. Our focus lies on three key areas: effective and safe intervention, acting on intelligence and information, and a systematic approach to safety and infrastructures.

OPTIMUM USE OF ICT

ICT has assumed an expanding role in our daily lives. From the comfort of our sofa we can visit the bank, order a DVD or pick up

information from the town hall. The use of ICT in our society is enormous, and we have not even begun to exhaust the possibilities. How can we use ICT even better in our society? What services and networks can you develop to further improve the communication and information exchange between people in home and work situations? And what is an appropriate strategy for this? TNO is working to answer these questions.

HIGH-TECH SYSTEMS, PROCESSES AND MATERIALS

Faster and smaller products continue to come on to the market and offer greater functionality. Whether it's a hearing aid or a mobile phone. To manufacture these Microsystems requires special high-tech instruments and production equipment able to work on micro, nano and even pico scale. Such systems are developed not only in Japan and America but also in the Netherlands. Dutch industry wants to hold on to its competitive edge through the innovative use of high-tech materials. TNO is helping them with its knowledge and expertise.

CONSOLIDATED BALANCE SHEET

PER 31 DECEMBER 2009

after appropriation of result

(in EUR x thousand)

		31-12-2009	31-12-2008
Fixed assets			
Intangible fixed assets	1	1,867	2,783
Tangible fixed assets	2	257,525	256,996
Financial fixed assets	3	3,576	3,381
		262,968	263,160
Current assets			
Stocks and work in progress	4	-21,705	-12,499
Receivables	5	82,396	102,529
Cash	6	113,714	104,902
		174,405	194,932
Total		437,373	458,092
Equity:			
- General reserves	7	127,232	142,926
- Appropriated reserves	8	59,739	58,205
		186,971	201,131
Third-party interests		1,406	1,065
Equalisation account for investment funds	9	46,302	48,945
Provisions	10	26,800	31,623
Long-term debt	11	11,636	11,919
Short-term debt	12	164,258	163,409
Total		437,373	458,092

CONSOLIDATED PROFIT AND LOSS ACCOUNT FOR 2009

(in EUR x thousand)

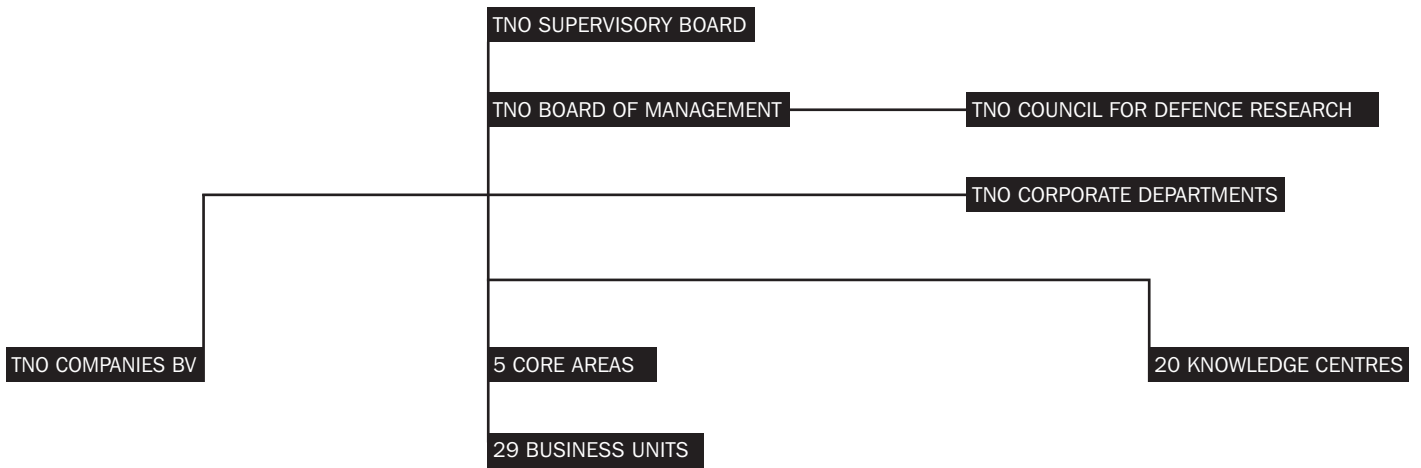
			2009	2008
Income	13	576,226		599,663
Other operating income	14	10,488		12,229
Operating income			586,714	611,892
Direct project costs	15	-82,660		-95,095
Personnel expenses	16	-377,723		-378,609
Depreciation of intangible fixed assets		-1,167		-1,716
Depreciation of tangible fixed assets	17	-33,794		-32,679
Impairment of tangible fixed assets	18	-4,676		-5,327
Other operating costs	19	-103,379		-109,020
Operating costs			-603,399	-622,446
Operating result:			-16,685	-10,554
Interest received			2,844	5,000
Interest paid			-916	-1,095
Result on ordinary operations before taxation			-14,757	-6,649
Taxation			109	-612
Income from financial fixed assets			327	1,385
Result on ordinary operations after taxation			-14,321	-5,876
Third-party interests			127	159
Net result			-14,194	-5,717
Appropriation of result				
Net result			-14,194	-5,717
Additions to:				
- appropriation reserve for civil operating risks		-759		-2,903
- appropriation reserve for defence operating risks		-		-156
- appropriation reserve for development cooperation		-		-
- appropriation reserve for new defence buildings		-4,907		-8,845
			-5,666	-11,904
Withdrawals from:				
- appropriation reserve for civil operating risks		-		3,700
- appropriation reserve for defence operating risks		-		-
- appropriation reserve for development cooperation		606		1,101
- appropriation reserve for new defence buildings		3,526		1,938
			4,132	6,739
Result after movements in appropriated reserves			-15,728	-10,882
Change in general reserve			15,728	10,882
			-	-

ORGANISATION STRUCTURE

TNO was established by law in 1932 to support industry and government that had no R&D capacity of their own. TNO is an organisation able to provide objective scientific judgement, independent of private or public interests. In most cases TNO's customers themselves commercialise the knowledge developed by TNO. In addition,

TNO is also active in the commercialisation of this knowledge, thereby bringing TNO knowledge to market. This commercialisation of knowledge is contained in the private limited company TNO Companies BV, which is separate from the statutory TNO organisation. The shareholding of the statutory TNO organisation fosters the transfer of knowledge

to the private domain. This private-public organisational structure of TNO satisfies the most recent market and government insights.



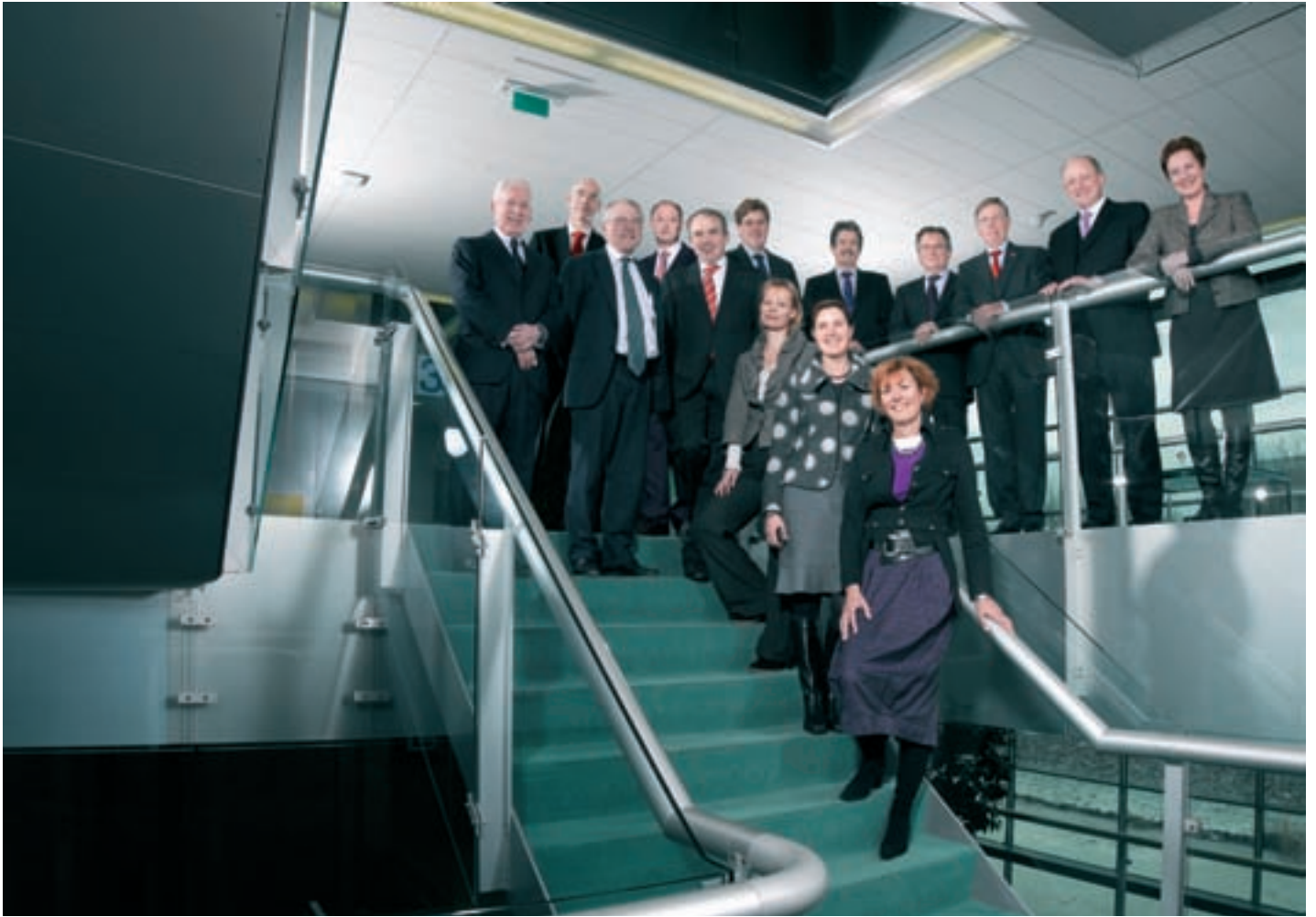
TNO-LOCATIONS

TNO has a number of branches throughout the Netherlands and abroad. A full list of these along with contact details can be found on www.tno.nl/locations.

If you are looking for a solution to a specific problem or would like to know whether TNO can help you, then contact the TNO Infodesk. TNO Infodesk can tell you who is best placed to help you and put you in touch with the right person at TNO so that you can get to know our expertise, enthusiasm and commitment directly.

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EXECUTIVE COUNCIL OF TNO



The Executive Council of TNO comprises the TNO Board of Management, the managing directors of the five core areas, The corporate departments heads and the director of TNO Companies B.V.

Left to right:

N. Suesan (MA), G. Bosveld, Dr. C. L. Ekkers, C.H.M. van Gerven (MA), J.V. Elsendoorn (MSc), Dr N.J. Snoeij, D.Ph. Schmidt (MSc), P.A. Korting (MSc), J.W. Kelder, J.J. Mengelers (MSc), C. van Heest (MA).

On the staircase:

S.J. Vlaar (MA), Dr. C. M. Hooymans, I. van den Broek (LLM).

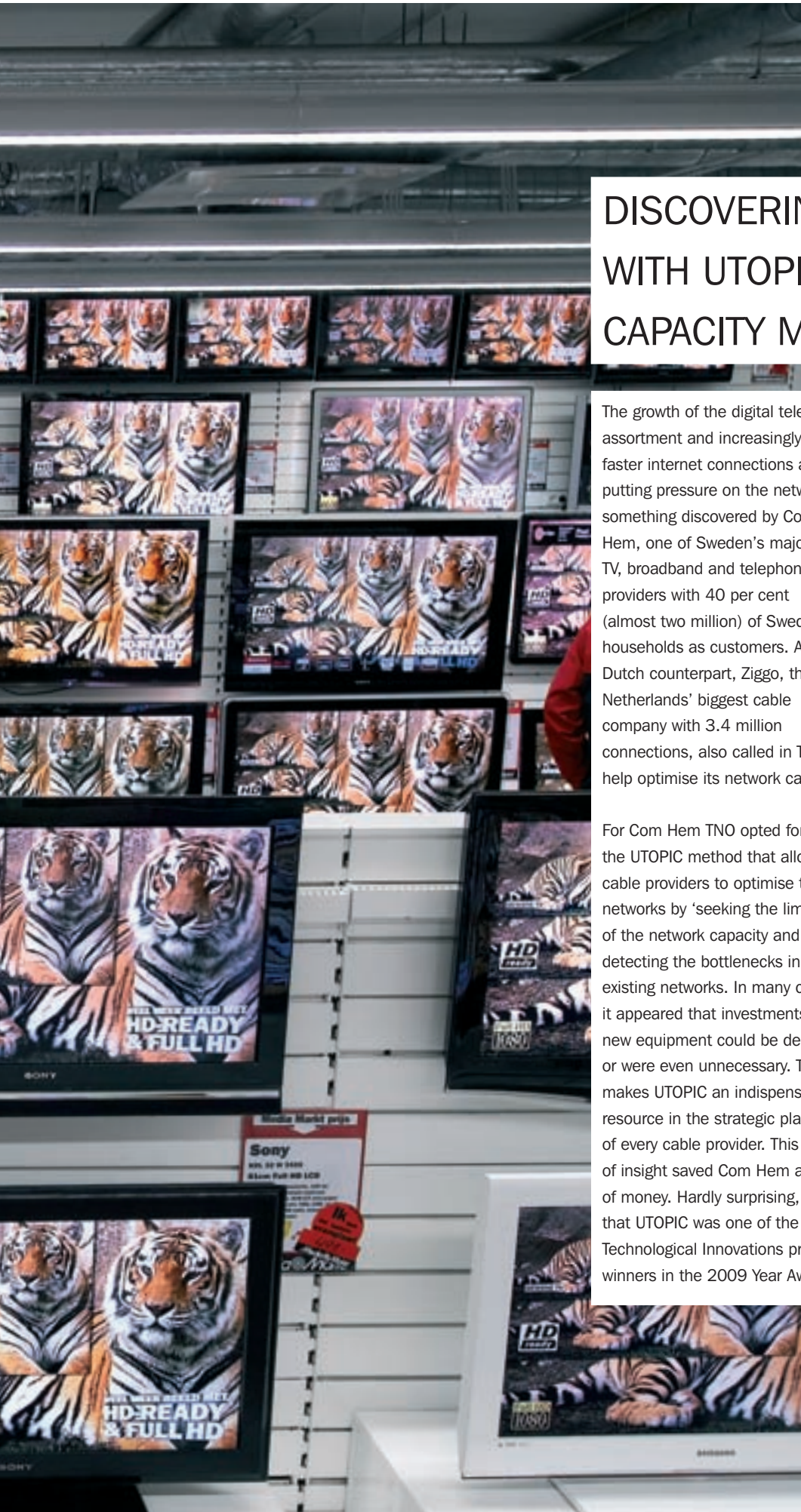
OTHER INFORMATION

STATEMENT OF THE TNO BOARD OF MANAGEMENT

The consolidated and company balances sheet as at 31 December 2009 and the consolidated and company profit and loss account for the year then ended have been derived from the financial statements of TNO for the year 2009.

Our auditors issued an unqualified opinion on these financial statements in their auditor's report, dated March 17, 2010.





DISCOVERING NETWORK LIMITS WITH UTOPIC AND CAPACITY MANAGEMENT

The growth of the digital television assortment and increasingly faster internet connections are putting pressure on the network, something discovered by Com Hem, one of Sweden's major TV, broadband and telephony providers with 40 per cent (almost two million) of Swedish households as customers. And Dutch counterpart, Ziggo, the Netherlands' biggest cable company with 3.4 million connections, also called in TNO to help optimise its network capacity.

For Com Hem TNO opted for the UTOPIC method that allows cable providers to optimise their networks by 'seeking the limits' of the network capacity and detecting the bottlenecks in their existing networks. In many cases it appeared that investments in new equipment could be delayed or were even unnecessary. This makes UTOPIC an indispensable resource in the strategic planning of every cable provider. This kind of insight saved Com Hem a lot of money. Hardly surprising, then, that UTOPIC was one of the SCTE Technological Innovations prize winners in the 2009 Year Awards.

When Casema, @Home and Multikabel merged to become Ziggo, this company was in need of an external player to get its capacity management on track, so TNO set up a process for capacity management that took account of all internal dependencies. One of the problems we took up was the lack of harmonisation. In December 2009 this process came under the new Planning & Control department that now coordinates the capacity for the whole company. Moreover, all the planners of TV, internet and telephony, who had previously operated separately, come together twice a year.

TNO has also developed a tool that uses trends in datatrafic to establish very accurately how much capacity, and therefore network components and physical space, is required. Time-consuming manual calculations are now a thing of the past. Ziggo is able to constantly calculate the required capacity and prevent unnecessary investments. And the customer more than ever gets what he pays for: the right capacity at the right moment.



HEALTHIER AND JUST AS TASTY: BACON WITH 40 PER CENT LESS SALT

The food industry wants to respond to demand for healthier food and is therefore developing products with lower fat, sugar and salt content. Not always an easy matter, certainly if you want to keep the product quality high and costs low. However, as far as health is concerned, it is essential to reduce the salt content in products since salt can cause blood pressure to rise and high blood pressure increases the chance of heart and vascular diseases.

For the Dutch Cattle and Meat Commodity Board, TNO studied the lowering of salt content in bacon that, in a sodium chloride compound, enhances the salty flavour, texture and shelf life of bacon.

In the bacon study TNO ultimately produced, cut, packaged and assessed bacon from a variety of salting recipes with differing levels of salt percentages. A professional panel evaluated this bacon and discovered that it was technologically possible to lower the salt content of the bacon by 40 per cent without compromising the taste, quality or shelf life. This knowledge is already being used by bacon producers and TNO is working with the food industry on the next steps towards the production of healthier products on the basis of the same principle.





WORKING ON PUBLIC SAFETY: SAFER LIFEBOATS

In an emergency the personnel of offshore installations, like oil-drilling platforms and tankers, have to be evacuated quickly by lifeboats, or so-called free-fall lifeboats that are dropped into the sea from a considerable height. Sometimes these boats can fall more than twenty metres into a rough sea, and the blow when the boat hits the water can have serious consequences for the occupants.

TNO has been putting its expertise in the field of impact safety and injury prevention to good use to predict possible injury.

TNO's method combines impact testing and numerical simulations. Using sensors, built into dummies, we measure the forces, velocities and accelerations. We are thereby able to predict the possibility of injury in

various circumstances. Together with the Norwegian Oil Industry Association we have analysed more than twenty different lifeboats in more than ten thousand different scenarios, taking account of such aspects as wave height and restraint systems. The result of this project is a safer restraint system and a matrix that more clearly reveals the conditions under which personnel can be safely evacuated.





PROPERTY MAINTENANCE THAT GETS RESULTS

Maintenance documents for property maintenance have been no more than a snapshot to date, with no agreements concerning quality but simply work obligations. Customers – housing associations and municipal authorities – tend to assess quotations based on these maintenance documents purely by price, which leaves the maintenance companies little scope for collaboration. They cannot make any use of their insight and knowledge and have to compromise on quality. Painful for both property managers and maintenance companies alike.

Maintenance can be better and cheaper, then. A good start is TNO's results focused building and maintenance concept that is founded on the building consortium as a whole, from architect to contractor and supplier, responsible for new building development and maintenance. This consortium makes longterm agreements on results in respect of guaranteeing the functionality of buildings. These agreements are valid throughout the whole period of operation,

from new development to demolition. This results focused concept also complies with societal requirements like energy-neutrality and sustainable maintenance with minimal CO₂ emission.

Various pilot projects have shown that results focused property maintenance works out 20 per cent cheaper than traditional maintenance. Moreover, residents and users are more satisfied with this system. While an initial investment is required, once the quality specifications have been agreed, no further time-consuming and unproductive quotation and tender procedures have to be started up for, for instance, 25 years. TNO realised a variety of results focused property maintenance projects last year with the De Woonplaats housing association in Enschede. Subsequently, different initiatives have been taken in results focused building. Results focused property maintenance can, therefore, be rightly termed a revolution in the building sector.



REVOLUTIONARY SONAR SYSTEMS: LOW FREQUENCY ACTIVE SONAR

TNO's Low Frequency Active Sonar system (LFAS) gives the Netherlands the international edge in submarine detection. What is now still a demonstrator is soon likely to be reality: netcentric observation with this hypermodern, towed sonar system for naval vessels.

LFAS is an active low-frequency sonar: a towed transmitter that emits low-frequency noise in all directions. This low-frequency noise is less absorbed by the water than the current high-frequency noise of current sonar systems, making the LFAS detection range greater.

Once the LFAS echoes have been received, the signals are processed to detect and classify the targets. Classification is tricky given the amount of echoes received by LFAS, so filtering of relevant signals is essential.

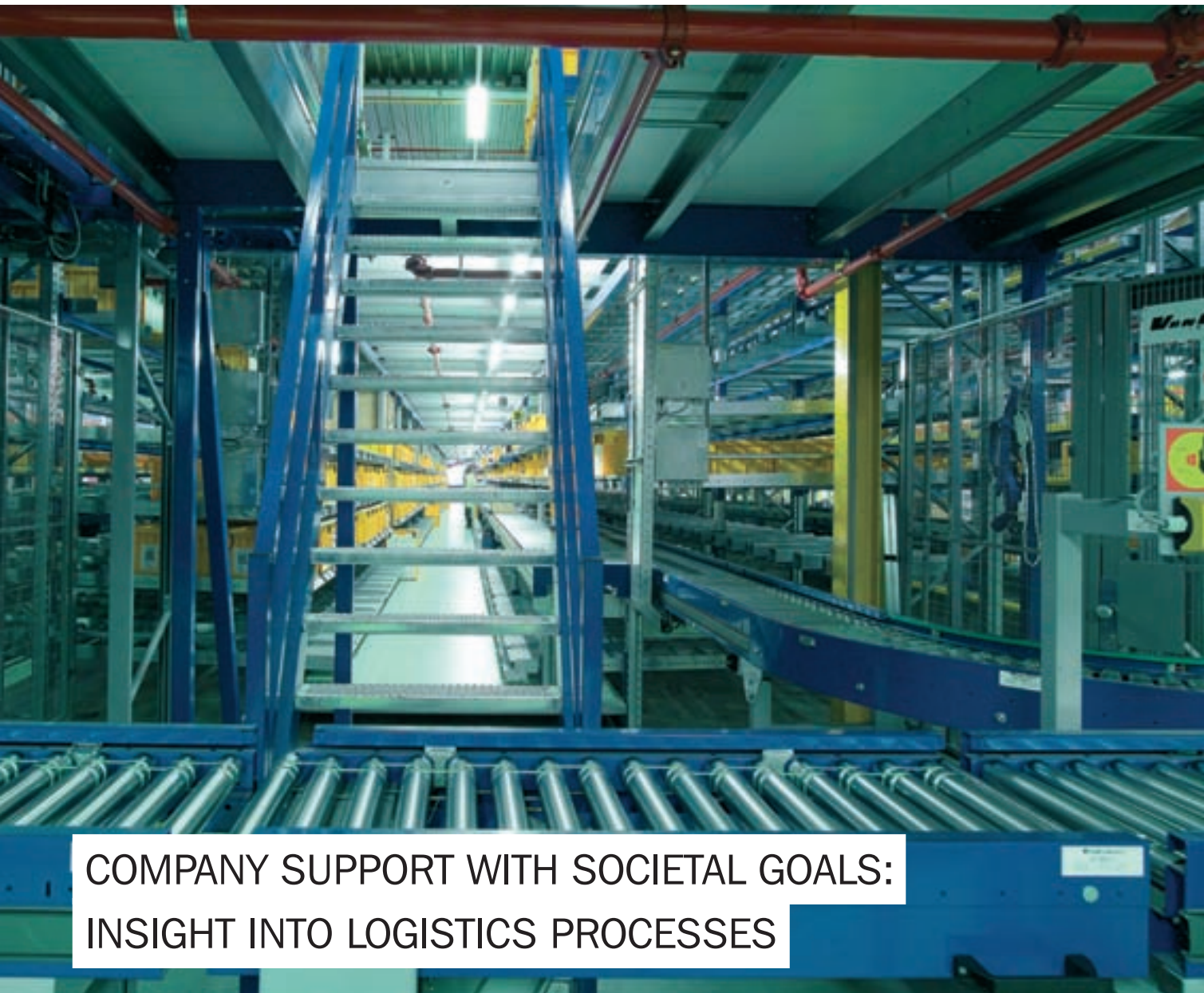
The Netherlands Royal Navy M frigates currently still use sonar systems developed during the Cold War era that target submarines in the deep ocean. Since the navy tends to operate more often in coastal waters nowadays in support of amphibious landings, an update is needed. The new LFAS system enables the

navy to better detect and classify submarines and torpedoes in shallow water.

It is exceptional that TNO has been working with Defence in a range of projects using the new technology to determine what is required of the system. Like the IRLFAS project in which TNO and the navy built an LFAS demonstrator for the Netherlands Royal Navy to facilitate field trials with LFAS. The researchers go to sea a couple of times a year, sitting next to the operators – a closer form of collaboration you cannot get.

The catchword for the implementation of new sonar systems like LFAS is “responsible”. The TNO LFAS processor will soon incorporate a module to detect and classify sea mammals, estimating their distance from the ship. Defence and TNO have been working for many years to quantify sonar noise and monitor its effects, especially on the behaviour of sea mammals. TNO has developed software to advise the sonar operator of animal protection measures and the use of sonar to monitor sea life.





COMPANY SUPPORT WITH SOCIETAL GOALS: INSIGHT INTO LOGISTICS PROCESSES

Logistics is not a core activity for most companies but a support process. Yet this is a key activity because if the logistics processes are not up to scratch, the company could suffer in terms of time, money and even customers. Therefore, TNO has developed different models whereby companies can optimise their logistics processes or detect the causes of their logistics problems. Smart logistics can also contribute to societal goals such as fewer traffic jams, lower emissions and better traffic safety.

TNO's RESPONSE™ model is a good example of how we combine our scientific knowledge and field

experience to study the logistics network. Does a company get the right quantity of the right product in the right place at the right time? Is it better for a certain company to have ten branches spread throughout Europe or does it make more sense to work from a single base? TNO answers these kinds of questions for large and medium sized companies, intermediary organisations and for Dutch and European governments. Among the customers are Harley Davidson, Texas Instruments, Ricoh, Hema, V&D, The Greenery, Centraal Boekhuis and Sensata.

Another tried and tested tool we have developed is the logistics

thermometer that identifies a company's logistics process using company data, interviews and questionnaires. The result is immediate and clear insight into the major bottlenecks and an improvement plan in which the bottlenecks that most affect the customer can be studied in detail and the causes discovered. We base this approach on a planning, control, information and organisation model (PBIO). These processes are highly interdependent and need to be kept in balance so that the logistics process is not disrupted.



DUTCH GROUNDWATER: REGISTER GIVES OVERVIEW OF WATER USE

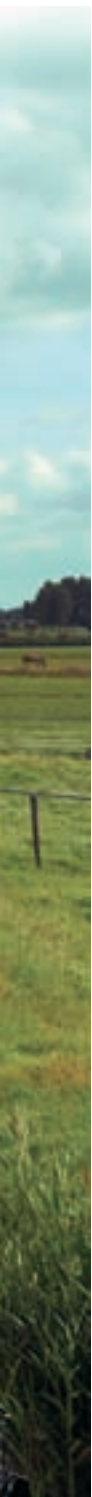
Two-thirds of our drinking water comes from groundwater, farmers sprinkle their crop fields with groundwater and industry uses it for their process and cooling water. To date the provincial authorities have monitored how various parties use groundwater, for instance, to prevent natural areas drying out or conflicts arising. TNO has been asked to set up a national groundwater register for the data transfer.

The provinces have had to transfer thousands of groundwater data to the Water Boards but

since their boundaries do not always coincide with those of the Water Boards, this has become administratively very complex. This is why the Inter-Provincial Council asked TNO to establish a central, national register whereby each Water Board needs only to consult a single database. Moreover, this also enables the provincial authorities and the Water Boards to link their information to national monitoring networks and thus boost the quality of their decisions.

Differences in issues and policy accents were among the problems in merging the twelve

provincial groundwater databases into a single national register. Using the data standard of one particular province, Overijssel, and working with groundwater and ICT specialists, TNO was able to set up, maintain and structure a central data archive and make it accessible to all the provinces. They are now to connect their systems to this national groundwater register.



TNO AND THE CO₂ FOOTPRINT: THE CLIMACOUNT LIFESTYLER

Whether it's mobility, logistics, the environment or spatial planning, every policy decision in the Netherlands has to be taken against a background of climate change. TNO has a special role to play in this. We are an independent institute and the very close contacts we have with government and industry enable us to translate our knowledge of the causes and effects of climate change into effective proposals for measures, and help get them implemented.

The TNO projects with the publisher of the Visa Greencard, Repay International, are a good example of the collaboration between TNO and industry. Payment by VISA Greencard compensates the CO₂ emission of that purchase directly and thus makes it CO₂ neutral. This is done through investment in CO₂

efficiency projects in the fields of forestation, sustainable energy and energy efficiency. TNO validates the CO₂ compensation method used by the credit card. TNO has also developed the ClimaCount LifeStyler calculation model, a web tool (see www.climacount.com) whereby the customer discovers, through a personalised summary, the extent to which his or her lifestyle causes CO₂ and whether that amount is excessive or little. The calculation is comprehensive because the LifeStyler looks at the impact of personal behaviour in the entire lifecycle of the respective products or services, such as a holiday. From the raw materials used in the production to the disposal thereafter. A smart step towards greater awareness.





SMART INFRASTRUCTURE, MORE EXERCISE, HEALTHY LIFE

A 'healthy district' has plenty of facilities for sport, culture and parkland that are easily accessible for all. A healthy district is a place where children can walk or cycle to school by themselves, play in the playground or go to a sports club. This is the way for them to get their daily sixty-minute dose of exercise. It does, however, require good traffic safety in the district, yet the place of people in their environment is often a forgotten element of infrastructure planning. This is probably because in municipal terms, sport, recreation, welfare, the environment and infrastructure are separate aspects. So TNO has come up with a solution: bring these various fields and TNO's expertise in local habitat together in an interactive tool for spatial planning: 'Urban Strategy'.

Urban Strategy reveals a 3D representation of the built environment in which the municipal authorities can interactively make changes, like an extra neighbourhood, road closure, moving sports facilities, adding play areas, etc. Using hypermodern calculation models, the tool then calculates the impact such changes will have on the quality of the habitat. A final step in the Urban Strategy tool's development is the incorporation of children's exercise behaviour. This enables municipalities, corporations and project developers to take account of this component in the architectural layout of districts.



HEALTHIER POSTURE GHANAIAN FARMERS WITH NEW HOE

Many farmers in North Ghana complain of backache. They are, quite literally, bent over double working on the land. This is caused, in part, by their traditional hoe. TNO collaborated with two groups of farmers from the Bolgatanga area, the University of Tamale, the Kalabash Foundation and the local technical college to find a solution. This close collaboration produced three new types of hand tool that allow the local farmers to work the land with a more upright posture and, we expect, more efficiently. The result: more production and less physical strain.

While testing the tool, it appeared that the farmers needed training and coaching to enable them to use the tool more efficiently and, therefore, to see the benefits and the value of investing in the new tool. To this end we will be continuing development of the new

tool and testing it again in 2010 among a larger group (2 x 100) of Bolgatanga farmers. TNO will be working with local training organisations to train the farmers in using the new tool and in organic farming. We will also be getting four smaller groups in the Tamale area under way.

As for what the new tool should cost, we worked with MBA students at the University of Amsterdam to draw up a business model. This revealed that the farmers themselves were able and willing to spend a maximum of 5 cedis (around 2.50 euros) on the new hoe, 2 cedis more than the cost of the current hoe. This represents a good investment since it will last for three years at least – the current hoe is good for just one year. The price is therefore the decisive element in the definitive design and market introduction.





SUSTAINABLE ENERGY SUPPLY WITH SMART GRIDS

Sustainable energy is the future. But how can we rise to the challenge intelligently? This is a typically multidisciplinary subject that TNO likes to tackle by clustering its strengths. So a team of specialists got together to examine the 'smart grids' energy phenomenon. The conclusion: it is vital to get them implemented in society as fast as possible. But what are smart grids exactly?

Smart grids is a generic term for all kinds of 'smart' (digital) solutions that will help realise future energy supply. New demands are

being made of the energy network, especially with the emergence of decentralised energy production and other sustainable applications. This network has consisted of one-way traffic for decades: a centrally produced electricity and gas supply for consumers. But the arrival of wind and solar energy, total energy and the input of biogas into the network will increasingly bring about two-way traffic. Smart grids allow the network administrators to better identify the flows of gas, electricity and sustainable heating, which will enhance the network performance. In addition, smart

grids play an important role in all kinds of new applications that optimise the use of the network, like distributing the charging of electric cars such that no overload occurs in the network. The new, more sustainable technologies will also have to generate more energy and cost savings among consumers.



SAFER BORDERS: NEW BORDER CONTROL CONCEPT

National borders used to be guarded mainly to keep out unwanted intruders. With the current increase in the threat of terrorism and mobility, the job has been compounded by the need to combat terrorism and pandemics. This involves many different parties, like the military police, customs, coastguard, airports and airline companies, counter-terrorism units and the immigration department. All these parties have ideas about rapid, smart border control but lack a common vision. So the Dutch military police asked TNO to create such a concept.

An important starting point for this concept was formed by work sessions with the military police and discussions with representatives from both public and private organisations involved in border control. These sessions revealed the difficulties in merging optimum safety and mobility. So TNO developed a future vision with better, smarter and faster border control at its heart. This vision is based on six main aspects: one system, one comprehensive database management, the right combination of people and technology, a focus on national and international security, the active contribution of border guards and travellers, all guided by risk considerations. A set of guidelines has been detailed in thirteen tangible building blocks such as the remote monitoring of traveller data, traveller registration, biometric identification and automatic border passage using passport scanners. TNO has drafted a transition plan that describes the responsibilities of the military police and the other players involved if all these building blocks are to be realised. Cooperation among all the parties is essential if we are to have better, smarter and faster border control.



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Ghana: Hollandse Hoogte / Sven Torfinn van Enkevort

Sonarsystems: Mark van Spellen, TNO

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If you are looking for a solution to a specific problem or want to know whether TNO can help you, just contact the TNO Infodesk. Our Infodesk can tell you the next step to take and ensure that you get in touch with the right person at TNO. This will allow you to experience our expertise, enthusiasm and commitment for yourself.

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